M/047/0090
April
6888

Form MR-REV-att (DOGM – Revise/Amend Change Form)
(Revised September 14, 2005)

Application for Mineral Mine Plan Revision or Amendment

Operator: U.S. Oil Sands Inc.

Mine Name: PR Spring Mine **File Number: M/** 047-0090

Provide a detailed listing of all changes to the mining and reclamation plan that will be required as a result of this change. Individually list all maps and drawings that are to be added, replaced, or removed from the plan. Include changes of the table of contents, section of the plan, pages, or other information as needed to specifically locate, identify and revise or amend the existing Mining and Reclamation Plan. **Include page, section and drawing numbers as part of the description.**

DETAILED SCHEDULE OF CHANGES TO THE MINING AND RECLAMATION PLAN

			DESCRIPTION OF MAP, TEXT, OR MATERIALS TO BE CHANGED
☐ ADD	☒ REPLACE	☐ REMOVE	Table of Contents (new)
☐ ADD	☒ REPLACE	☐ REMOVE	(pgs. 32-54 new) adjusted ground water & air quality section
☒ ADD	☐ REPLACE	☐ REMOVE	(Appendix B)-new updated water monitoring program
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	RECEIVED
☐ ADD	☐ REPLACE	☐ REMOVE	SEP 29 2015
☐ ADD	☐ REPLACE	☐ REMOVE	Div. of Oil, Gas & Mining
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments and obligations, herein.

Doug Thornton
Print Name

[signature] HSE & Regulatory Mgr.
Sign Name, Position

Sept. 23, 2015
Date

Return to:

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
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FOR DOGM USE ONLY:
File #: M/ /
Approved:
Bond Adjustment: from ($)
to $

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gradient to the north. As noted above, this was confirmed by the operator's two production wells, located within about one mile of the Phase 1 project area. (One of those wells intercepted a small amount of water at a depth of about 670 feet, which is about the same elevation as the nearby Main Canyon floor.)

At their maximum depth of approximately 150 feet below ground surface, none of the three Phase 1 pits are expected to encounter or approach this regional groundwater table. Further, because mining occurs on the hydrologically isolated interfluve between PR and Main Canyon, the Phase 1 mining will not affect groundwater gradient or quality. Litigation challenging the definition of ground water in this area was eventually dismissed by the Secretary who determined that there was only a limited amount of shallow, localized ground water at the site that is not part of a regional aquifer system (Supreme Court of the State of Utah opinion 2014 UT 25).

The operator's use of up to 360 acre-feet per year of groundwater obtained from the two production wells that intercept the deep regional aquifer will not adversely impact the local groundwater regime. Water usage is estimated at approximately 168,480 gallons per day and 61.5 million gallons per year (189 acre-feet). The wells draw from the deep, low quality regional aquifer that is not a source for natural surface expressions or other wells in the region. The State Engineer confirmed this absence of connectivity in early 2014 in resolving a protest on a temporary change application to allow additional uses and places of use associated with the water right. The State Engineer found that neither production well is impacting a spring in the bottom of Main Canyon located approximately 3/4 mile south of one of the production wells and which discharges at an elevation of 7,440 (approximately 1,000 feet higher than the static water level in the wells).

The operator and DWQ have reviewed the project's Permit by Rule coverage under DWQ's Groundwater Protection Program. DWQ continues to support the *de minimus* impact of the project (including the planned pit backfills with processed solids) on groundwater resources. Copies of related correspondence are included in **Appendix B**.

In July of 2015 the Division of Oil, Gas and Mining requested that the operator submit an amendment to this NOI to establish a monitoring program for potential effects to the possible subsurface water system. Copies of the related correspondence, the associated spring and well evaluations and the full detailed monitoring program are included in **Appendix B**.

The monitoring program includes monitoring of USOS's deep water wells PW-1 and USO-5 (see Figure 2) and a total of four springs depending upon granted access and flow. Three of the springs are located in Main Canyon, 32-1, 31-1 and 6-1 (see Figure 1.1 in the Appendix B water monitoring program). The fourth spring is PR Spring located adjacent to Seep Ridge Road (see Figure 1.1 in the Appendix B water monitoring program).

The parameters to be monitored at the wells and at each spring are: Flow, Total Dissolved Solids (TDS), pH, basic anions and cations and a d-limonene tracer (the solvent used in the process). The frequency of monitoring will be three times a year for the first two years, and twice a year thereafter. Summary reports will be submitted to the Division of Oil, Gas and Mining upon request and/or annually with the annual mining progress reports.

WATER RIGHTS

According to online records of the State Engineer's Office, (Utah Division of Water Rights) there are a number of water rights in the region, as shown in Table 8 and on **Figure 9**. None of these would be affected by the operator's operations.

Table 8: Water Rights

Water Right No.	Water Source	Quantity (cfs)	Use	Water Right Owner
49-55	Unnamed Spring	0.002	Stock watering	John S. Purdy
49-57	PR Springs	0.002	Stock watering	John S. Purdy
49-193	Unnamed Spring	0.025	Stock watering	Alameda Corp.
49-196	PR Springs	0.021	Stock watering	Alameda Corp.
49-262	PR Springs	0.011	Domestic & stock watering	BLM
49-495*	Meadow Spring	0.015	Stock watering & wildlife	SITLA
49-496*	South PWR Meadow Spring	0.015	Stock watering & wildlife	SITLA
49-497*	North PWR Meadow Spring	0.015	Stock watering & wildlife	SITLA
49-498*	West Willow Reservoir #3	0.25	Stock watering & wildlife	BLM
49-499*	West Willow Reservoir #2	0.25	Stock watering & wildlife	BLM
49-500*	PR Reservoir	0.25	Stock watering & wildlife	BLM
49-504*	Jacks Canyon Spring	0.015	Stock watering & wildlife	BLM
49-1504	Unnamed Spring	0.05	Stock watering	SITLA
49-1505	Unnamed Spring	0.05	Stock watering	SITLA
49-1506	Unnamed Spring	0.05	Stock watering	SITLA
49-1508	Unnamed Spring	0.05	Stock watering	SITLA
49-1512	Horse Canyon Unnamed Spring	0.05	Stock watering	SITLA

Water Right No.	Water Source	Quantity (cfs)	Use	Water Right Owner
49-1513	Horse Canyon Unnamed Spring	0.05	Stock watering	SITLA
49-1514	Horse Canyon Unnamed Spring	0.05	Stock watering	SITLA

Online water right records indicate that these claims "[have] not been established in accordance with statute and [their] validity is in question.*"

In addition, the operator, through an agreement with the Uintah Water Conservancy District, will use approximately 360 acre feet of water originally allocated under Water Right No. 41-3523 via a water rights transfer to Water Right No. 49-2274. The two previously discussed production wells are associated with this water right.

109.2 Wildlife Habitat and Federally Listed Species

Habitats in the Phase 1 mine area and surroundings are characterized by the flat-lying plateau above Main Canyon and PR Spring Canyon. Ephemeral drainages drop steeply off the plateau into these canyons. Existing vegetation includes mixed shrub and sagebrush/grassland communities on the ridge tops, with juniper on upper slopes and side slopes, trending to a Douglas fir community as elevation decreases. There are some aspen patches in the drainages.

The Utah Division of Wildlife (DWR) Utah Conservation Database (UCD) lists plant and animal species that are federally designated as Threatened, Endangered, or are Candidates for Designation in Utah, or are listed as Sensitive Species by the DWR. Those that are listed as present in the southern portions of Uintah and/or the northern portions of Grand Counties are listed below in Table 9 (with the exception of listed fish species, since there is not adequate live water to support fish on or near the Affected area). The information was taken from the UCD website on April 24, 2014.

On August 6, 2014 the U.S. Fish and Wildlife Service (USFWS) withdrew the proposal to list Graham's beardtongue (*Penstemon grahamii*) and White River beardtongue (*Penstemon scariosus* var. *albifluvis*) as threatened species throughout their ranges or to designate critical habitat for these species. This is noted below in Table 9. The withdrawal was based on the conclusion that threats to these species and their habitats have been reduced.

The Utah Natural Heritage Program (NHP) of the DWR was contacted directly for information about known occurrences of species of concern. Their response letter, attached in the correspondence section (**Appendix B**), listed occurrences of the Mexican spotted owl (*Strix occidentalis lucida*) and greater sage-grouse (*Centrocercus urophasianus*) in the vicinity of PR Spring lease block. Species accounts are provided in the following sections.

Table 9: Threatened, Endangered, and Candidate Species That May be Present at PR Spring Mine

Common Name	Scientific Name	Status	Elevation in Feet / Habitat	Chance of Presence at Project Site
Shrubby reed-mustard	*Hesperidanthus suffrutescens*	E	6,000-7,000	None due to elevation
Clay reed-mustard	*Hesperidanthus argillacea*	T	4,725-5,750	None due to elevation
Uinta Basin hookless Cactus	*Sclerocactus wetlandicus*	T	4,500-6,500	None due to elevation
Graham's beardtongue	*Penstemon grahamii*	Withdrawn from listing	4,600-6,700	None due to elevation
White River beardtongue	*Penstemon scariosus* var. *albifluvis*	Withdrawn from listing	5,000-6,680	None due to elevation
Jones cycladenia	*Cycladenia Humilis var Jonesii*	T	4,000-6,800	None due to elevation
Black-footed ferret	*Mustela nigripes*	T	Prairie dog towns	None due to lack of prairie dogs
Brown (grizzly) bear	*Ursus arctos*	T - Extirpated	Mountain timber	None
Southwestern willow flycatcher	*Empidomax traillii extimus*	E	Riparian areas with willows	None due to lack of riparian habitat
Greater sage-grouse	*Centrocercus urophasianus*	C	Sagebrush, rangelands	Unlikely due to lack of suitable habitat
Mexican spotted owl	*Strix occidentalis lucida*	T	Forests; steep rocky canyons	Unlikely due to lack of suitable habitat

PLANT SPECIES

Shrubby reed-mustard, *Hesperidanthus suffrutescens,* is a federally listed Endangered plant. This perennial, clump-forming mustard produces yellow flowers in May and June. It grows on shaley, fine textured soils of the whitish, semi-barren Green River Formation, Evacuation Creek Member. It is associated with mixed desert shrub and pinyon-juniper communities at elevations of 6,000 to 7,000 feet. The elevations in the PR Spring lease block are generally above, and the soils thicker and deeper than those noted above, making it highly unlikely that this species would be encountered within the immediate area.

Clay reed-mustard, *Hesperidanthus argillacea,* is a federally listed Threatened plant. This mustard produces white, purple-veined flowers that bloom from mid-April to mid-May. The plant is hairless with a stout, woody base. It occurs on the Green River Formation, Evacuation Creek Member, where it prefers precipitous slopes consisting of bedrock or scree mixed with fine-textured soils in mixed desert shrub communities at elevations of 4,725 to 5,750 feet. It is unlikely that this plant would be present within the PR Spring lease block due to elevation and site characteristics.

Uinta Basin hookless cactus, *Sclerocactus glaucus,* is a federally listed Threatened plant that is known to occur in central and southern Uintah county north of the PR Spring lease block. This cactus has a solitary, egg-shaped stem that is 3-12 inches long. Pink flowers are produced late April to late May. It is found on xeric, fine textured soils overlain by cobbles and pebbles on river benches, slopes, and rolling hills of the Green River and Mancos formations from 4,500 to 6,500 foot elevation. It is associated with salt desert shrub and pinyon-juniper communities. It is highly unlikely that this plant would occur on the area due to the higher elevation and moister site characteristics of the mine site.

Graham's beardtonque, *Penstemon grahamii*, was recently withdrawn as a Candidate for Federal listing. It occurs in the Uinta Basin of northeastern Utah and adjacent western Colorado. It exhibits thick leathery leaves, and large, tubular, light to deep lavender flowers that bloom from late May to early June. Graham's beardtongue grows directly on the weathered exposures of oil-shale strata associated with the Parachute Creek Member and Evacuation Creek Member of the Green River Formation at elevations between 4,600 to 6,700 feet. It is highly unlikely that this plant would occur i the PR Spring lease block due to the higher elevation and moister site characteristics of the site.

White River beardtongue, *Penstemon scariosus* var. *albifluvis,* was recently withdrawn as a Candidate for Federal listing. It is found in Duchesne and Uintah counties in Utah and Rio Blanco County in Colorado. This figwort has lavender to pale blue flowers that bloom in late May to June. It is found on semi-barren areas on white (infrequently red) soils that are xeric, shallow, fine-textured, and usually mixed with fragmented shale from 5,000 foot to 6,680 feet elevation. It is highly unlikely that this plant would occur in the PR Spring lease block due to the higher elevation and moister site characteristics of the mine site.

Jones cycladenia, *Cycladenia humilis var. Jonesii*, is a federally listed Threatened plant restricted to the canyonlands of the Colorado Plateau in Emery County, Garfield County, Grand County, and Kane County, Utah, as well as in immediately adjacent Coconino County, Arizona. A member of the dogbane family, it has somewhat succulent leaves with small rose-pink hairy flowers that bloom from mid-April to early June. Jones' cycladenia grows at elevations between 4,000 to 6800 feet in gypsiferous soils that are derived from the Summerville, Cutler, and Chinle formations; they are shallow, fine textured, and intermixed with rock

fragments. It is highly unlikely that this plant would occur in the area due to the higher elevation and moister site characteristics of the mine site.

ANIMAL SPECIES

The **black-footed ferret**, *Mustela nigripes*, is federally listed as Endangered. Thought to be extinct, the species was re-discovered near Meteetse, Wyoming in the 1980's. Since then a captive breeding program has allowed introduction of populations classified as "non-essential-experimental" by the U.S. Fish and Wildlife Service (USFWS) in the Coyote Basin area of Uintah County in 1999, as well as at other locations in the west. There are also unconfirmed sightings of naturally occurring black-footed ferrets in eastern Utah.

Black-footed ferrets are nocturnal and rely on prairie dogs for their primary food, thus they are closely associated with prairie dog towns. Loss of prairie dogs (i.e., by plague, poisoning, or habitat loss) directly threatens the survival of the ferrets. Due to the lack of prairie dog colonies in the Affected Area, no black-footed ferrets would be expected to occur.

The **grizzly** or **brown bear,** *Ursus arctos,* was extirpated (eliminated) from Utah in the 1920s. Because of the drastic decline in brown bear numbers and distribution, the USFWS has listed it as threatened in the lower 48 states. The last known sighting of a grizzly bear in the state of Utah was over 50 years ago, thus the grizzly bear in not expected to occur in the state or Affected Area and no evaluation is necessary.

The **southwestern willow flycatcher**, *Empidonax traillii*, is federally listed as Endangered. It is a rare summer resident of southern Utah up to the northern border of Grand County. It prefers riparian habitats with willows and breeds in late spring and early summer. The Affected Area is at the northern boundary of the southwestern willow flycatcher's range; the lack of developed riparian habitat in the Affected Area makes it unlikely that this bird would occur in this area.

The **greater sage-grouse** is a Candidate for Federal listing. On January 12, 2005, the USFWS announced a 12-month finding for three petitions to list greater sage-grouse as Threatened or Endangered, as not warranted. On December 4, 2007 the U.S. District Court of Idaho ruled that the 12-month petition finding was in error. The USFWS also determined that a new status review was appropriate in order to address new information that had become available since the 2005 finding (specifically, information published since Connelly et al. 2004). The USFWS found on March 5, 2010 that listing the greater sage-grouse (range-wide) was warranted, but that listing was precluded by higher-priority listing actions. The greater sage-grouse was assigned a Candidate Listing Priority Number of 8, where 1 is the highest priority (FR 75(55) [March 23, 2010]: 13910-14014).

These birds inhabit sagebrush plains, foothills, and mountain valleys. Sagebrush is the predominant plant of quality habitat. Where there is no sagebrush, there are no

sage-grouse. An understory of grasses and forbs and associated wet meadow areas are essential for optimum habitat. The birds are found at elevations ranging from 4,000 to over 9,000 feet and are highly dependent on sagebrush for cover and food.

Although greater sage-grouse are not protected by federal law, but as a "wildlife species of concern"; it is expected that conservation actions are needed to preclude the need to list sage-grouse under the Endangered Species Act. Greater sage-grouse are also currently listed as a Sensitive Species by the Utah DWR. Utah's Conservation Plan for greater sage-grouse (2013) includes incentive-based programs for private, local government, and SITLA projects. The goals of this plan are to protect, maintain, improve, and enhance greater sage-grouse populations and habitats within the established Sage-grouse Management Areas (SGMAs). The PR Spring lease block is not within or adjacent to any of the State's SGMAs. As noted in section 3.02 of the 2013 Conservation Plan for Greater Sage-grouse in Utah, "Sage-grouse habitat outside the SGMA's is not required for long-term conservation of the species. Much of this habitat has already been disturbed by human and natural causes and is not suitable for enhancement or improvement." It is unlikely that sage-grouse would inhabit the Affected Area for the PR Spring Mine project due to lack of suitable habitat.

The **Mexican spotted owl** was listed as a threatened species on 15 April 1993 (USFWS 2007). The Mexican spotted owl is found in the southern and eastern parts of Utah on the Colorado Plateau, where it is a rare permanent resident. The spotted owl occupies a variety of habitats in different parts of its range, including various forest types and steep rocky canyons, this last habitat being the primary habitat used in Utah. Mexican spotted owls are non-migratory. They feed mainly on rodents and use nests in trees (especially those with broken tops), trunk cavities, or on cliffs.

Critical Habitat has been designated for the Mexican spotted owl, however, it is not in the region of concern for this project. Mexican spotted owl nesting habitat, as acquired from the BLM Vernal Field Office indicate that there is no known nesting habitat within 1.5 miles of the PR Spring lease block. Mexican spotted owls may use areas adjacent to known nesting habitat for foraging and other behaviors. Concurrent gas well development in the area may have already impacted Mexican spotted owl behaviors and use of habitats in the region. Avoidance of the area would be generally short-term, as foraging habitats would be ultimately reclaimed.

The DWR UCD was also reviewed to determine the presence of other important big game wildlife habitats in the area. The PR Spring lease block is within summer habitat for elk and mule deer.

109.3 Existing Soil and Plant Resources

SOILS

Existing soil types in the vicinity of the Phase 1 project are described in Section 106.5 above and are shown in **Appendix C**. Phase 1 mine disturbance will require the removal of soils within the Seeprid-Utso complex, located on the tops and shoulders of the plateau and within the shallower Tosca soils, located on the slopes below the plateau. All of this soil will eventually be replaced on top of reclaimed areas to facilitate revegetation. Soils within the Gompers-Rock Outcrop complex may also be removed if feasible, but based upon current understanding of lack of soil present and slopes steeper than 2H:1V, the material balance assumes that this soil type may not be salvaged and thus would be permanently lost.

Reclamation will remain as concurrent as possible as mining advances and processed solids are replaced in the excavated pits. This will allow regrading, topsoiling, and seeding of some lands including portions of the mined-out pits. Thus, to the extent possible, direct placement of topsoil will be done, or interim storage will be short term. All salvaged soils will be used on-site in reclamation.

PLANTS

The area intersects four plant communities: Sagebrush-grass, Mixed tall shrub, Pinyon-juniper-Douglas fir, and Aspen glade (**Figure 10**), as discussed in Section 106.7, Table 3, and in **Appendix C**. Revegetation, discussed below in Section 110.5, will not provide an exact replica of vegetation removed, but will provide replacement vegetation to provide for a functioning post-mining land use.

109.4 Slope Stability, Erosion Control, Air Quality, Cultural Resources, Public Health & Safety

SLOPE STABILITY

All aspects of the Phase 1 project are designed to minimize slope stability risks. Each mining pit will be constructed predominantly on the relatively flat-lying terrain of the plateau top, minimizing slope-related risks. The OIS storage areas will also be constructed on relatively flat topography near the plateau top, intercepting only very small areas at the upper reaches of two small catchments. All mined or filled slopes, both interim and final, have been designed to be stable.

Regular and routine inspections will occur throughout the mine and extraction plant area to ensure the operating conditions remain safe, MSHA/OSHA safety guidelines are being followed, and the mining plan stated herein is being followed. This will include inspecting to verify the pit wall slopes are at the correct angles and they remain stable.

PITS

All three open pits will be excavated into the terrain, with highwalls maintained at approximately 1H:1V. Numerous existing road cuts and excavations in the area (including the operator's 2005 production test pit) are stable with slopes steeper than 1H:1V, providing evidence of the conservative nature of the operator's design. Any required blasting along the walls of the pit will be accomplished with small controlled blasts to eliminate over-break and weakening of the remaining material on the face of the slope.

As noted above, regular and routine inspections will occur to verify that the pit wall slopes are at the correct angles and remain stable.

Overburden/Interburden Storage Areas

Two small overburden/interburden storage areas will be constructed during the initial mining to store materials prior to sufficient area being opened so that backfilling can occur. The storage areas will be located on the ridge plateau and upper hillslopes above Main Canyon. As constructed, the slopes associated with the overburden/interburden storage areas will be at a maximum grade of between 2.5H:1V to 3H:1V, to facilitate reclamation.

Erosion Control

Runoff and erosion control is expected to be necessary at certain locations to prevent off-site erosional impacts. The SWMP in **Appendix G** discusses this in more detail. Generally, surface water will be restricted to that generated by on-site precipitation: little or no up-gradient runoff will enter the site. What surface water runoff does occur will be controlled such that erosion is minimized. Mine site storm water control is shown on **Figure 7**.

Some of the specific means of handling runoff and controlling erosion are described below, with more detail contained in the SWMP. In addition, should any specific means of handling runoff and controlling erosion be found to be ineffective, the operator would replace them with another type of BMP. These structures will be industry standard, using similar materials, installation techniques, and maintenance protocols as specified in DOGM's reclamation guide (DOGM 2008).

Since the affected area has an arid climate, it is anticipated that evapotranspiration will occur for most of the meteoric water falling on the backfill areas. To prevent material saturation and promote backfill stability for perpetuity, course overburden/ interburden rock will be used internally in the construction of the backfill to create small drainage corridors in areas where free drainage can be promoted. As backfill areas reach their final configuration and blend with natural topography, these areas will be covered with topsoil and revegetated as reclamation is completed. Appropriate BMPs may be used to prevent transport of any sediment or eroded material off the site.

Most of the haul roads will be integral or adjacent to the pits, OIS storage areas, and backfill areas. Additional erosion control is not required in these areas. As needed, however, some haul roads may be ditched, to intercept and transport water to appropriate storm water ponds. The SWMP (**Appendix G**) provides more details on these road runoff and erosion control features.

The plant site will be constructed to be internally draining through the use of perimeter berms or ditches as needed to direct runoff. All precipitation incident on the site (except for precipitation that falls directly into one of the secondary containment structures for the tank farm and non-hydrocarbon liquid storage areas or the process sump) will be collected in the storm water retention pond located at the low point of the plant site (**Figure 3a**). Sediment production from the plant site will be negligible, due to gradient and surfacing. Any sediment transported in runoff would eventually make its way to the storm water retention pond, which will be cleaned of sediments as needed. Sediment will be hauled to the backfill or OIS areas.

The man camp location is crowned such that the living areas are at the high point of the camp. Drainage is generally to the southeast and the site is designed so that no high velocity runoff channels would promote erosion of the camp area or adjacent land. Camp staff will monitor the perimeter of the camp area for signs of erosion or other water damage. The northwest side of the camp pad and access road are each constructed with drainage ditches along the perimeter of the structures to prevent water from pooling on the access road or along that side of the camp.

All BMPs will be regularly inspected, and maintained in operable condition. These above-noted types of BMPs are also described in the SWMP, which is included in **Appendix G**.

AIR QUALITY

The Phase 1 Project does not require either state or federal permits. However, the Project incorporates mechanisms and best management practices to minimize potential air quality impacts, including the following:

- Fugitive dust from stripped lands, the mine pit, OIS storage areas, backfill, and topsoil stockpiles.
- Fugitive dust from the plant site area and ore stockpiles.
- Emissions from the equipment used to mine, haul and separate bitumen from the ore.
- Fugitive dust from newly reclaimed lands.

The Phase 1 Project is located primarily in Uintah County, although portions of Pit 1 and Pit 2 are located in Grand County. The portion of the Project in Grand County is subject to the jurisdiction of the Utah Department of Environmental Quality, Division of Air Quality (Utah DAQ). The remainder of the Project in Uintah

County, including portions of Pit 1 and Pit 2, all of Pit 3, and the entirety of the Plant area, are within the boundaries of the former Uncompahgre Indian reservation which has been determined by the federal courts to be Indian Country and is therefore subject to EPA jurisdiction.

USOS calculated the potential emissions from equipment in the Plant area and those emissions are below federal permitting thresholds for minor sources operating in Indian Country. *See* 40 CFR Part 49 (Federal Minor New Source Review Program in Indian Country). The only non-fugitive emissions from the Project will result from the onsite diesel-fired generator, natural-gas fired generators, and process heaters. USOS has assessed the facility's potential emissions based on maximum process rates and the manufacturers' guaranteed emission factors for this equipment. Consistent with federal requirements, the operator will submit to EPA a registration of its emission sources with actual emissions within 90 days of beginning operations. 40 CFR 49.160(c)(1)(ii).

The portion of the Project in Grand County only has the potential to generate fugitive emissions, which are subject to state best management practices. Utah DAQ requires mining operators to develop best management practices to reduce fugitive dust associated with mining activities, including control measures designed to minimize fugitive dust during site preparation, mining, and reclamation operations. Utah Administrative Code R307-205-7 (requiring minimization of fugitive dust from mining activities). A fugitive dust plan that ensures compliance with these requirements is in place and USOS has extended these state requirements to the entire Project, including the areas that are not within the jurisdiction of Utah DAQ. An overview of the best management practices included in the fugitive dust plan are set forth below:

- The fugitive dust will be minimal from ore piles as the oily consistency of raw ore does not allow it to readily become airborne. Overburden and interburden may or may not be moist, depending on current weather conditions. Once the oil is removed from the ore, clean processed solids remain. As the solids from the plant will be damp-dry (less than 20 percent moisture), wind generated air borne particles are expected to be minimal but will be actively monitored; if necessary, water trucks will be utilized to reduce and control any fugitive dust.

- Haul roads will be sprayed regularly with water from a water truck. Water will be obtained from one of the production wells, in-pit storm water sumps or the processing plant storm water pond. Roads that are in use during most or all of the Phase 1 project may be paved with sub-grade ore to aid in dust suppression. Portions of the plant site may be similarly paved with sub-grade ore.

CULTURAL RESOURCES

Cultural resources were reviewed and inventoried onsite during surveys completed in April 2014 for the water wells and road/pipeline, April 2014 and May 2007 for the PR Spring Mine and plant site, and May 2011 for the man camp. No previously documented or new cultural resources were recorded (**See Appendix B**).

PUBLIC HEALTH AND SAFETY

The following measures are in place to protect public health and safety:

- MSHA safety guidelines will be followed in all aspects of the mining portion of the project.
- OHSA safety guidelines will be enforced for all aspects of the extraction plant downstream of the reclaim feed hopper as well as office, maintenance, and ancillary support facilities.
- There are no shafts or tunnels within the Affected Area and therefore none that require closing or guarding.
- All trash, scrap metal, and wood, and extraneous debris will be discarded in appropriate receptacles at a designated location prior to being routinely hauled offsite to a licensed facility. Further, volumes of material such as bitumen product and waste oil will be periodically removed from the site as needed so their allocated storage is not exceeded.
- Any exploratory or other drill holes will be plugged or capped as set forth in Rule R647-4-108.
- Warning signs will be posted in locations where public access to operations is readily available, including at the points of exit/entry from the main access road (Co. Road 2810) to the open pit and plant site.
- All blasting materials will be under the control and care of certified blasting contractors.
- Warning signs advising the public of blasting protocols will be posted at the access road to the pit area and at the appropriate locations as required by MSHA.
- All pit highwalls and areas where there is a leading edge embankment will be bermed.
- Adequate factors of safety will be maintained.
- During all mining work in the vicinity of the Summit Midstream natural gas pipeline, the operator would operate safely and in cooperation with Summit Midstream to ensure safety of both operations and the public.
- Containers stored on-site will be labeled so that all materials are clearly identified. Salvageable materials and other wastes will be stored at the plant site within the fenced area. Small quantities of necessary chemicals, lubricants, and fuels will be stored in appropriate containers according to appropriate building and fire codes.

R647-4-110. Reclamation Plan

110.1 Current Land Use and Post Mining Land Use

The current land use is mining, grazing, exploration, and wildlife habitat/open space. Due to the nature of exploration and ongoing activity in the Uinta Basin, the post mining land use may include exploration but is currently planned as wildlife habitat and open space. In order to ensure an environmentally safe and stable condition for the wildlife in the area that meets the objectives of the Utah Mined Land Reclamation Act 40-8-12, the operator will leave safe, stable topography; remove man-made structures including tanks, ponds, and containments; and establish suitable native vegetation.

110.2 Reclamation of Road, Highwalls, Slopes, Etc.

If economics allow, mining may continue in other portions of the operator's leases. In this case, facilities, and some roads may be maintained for access, and all new disturbances and operations would require additional approvals from DOGM. At this time, however, the mine/reclamation plan and associated bond estimate are based upon Phase 1 mining and the associated disturbance.

The overall objective of the reclamation plan described herein is to reclaim the entire Affected Area other than the well access road, so as to allow post-mining land uses of oil and gas exploration and development, wildlife habitat and open space to resume. This objective will be met in part by removing facilities and structures that have been brought to the site, topsoiling, and reseeding, as described in more detail below. The intent is to meet the requirements of the Utah Rules at R647-4, as stated in Section 110.6 below, and to meet the objectives of 40-8-12 of the Utah Mined Land Reclamation Act which include provisions for a safe, stable, environmentally functioning site. Concurrent reclamation of open pits, via backfill disposal of overburden, interburden, and processed solids will spread the reclamation obligation over the life of the project.

Throughout the reclamation activities, visual inspections will regularly be made at the site, focusing on erosion and sediment control, further ensuring the reclamation goals can be met. It is anticipated further visual inspections will be made by DOGM, and will include ensuring that all reclamation activity obligations under the Utah Mined Land Reclamation Act and associated rules are being met. These inspections will continue until such time as DOGM approves the reclamation work and releases the surety.

Various types of equipment will be used to accomplish the reclamation objectives, as detailed in the surety calculations (**Appendix E**). This equipment includes, among others: dozers, graders, scrapers, cranes, hand power tools, dump trucks, loaders, semi- and low-boy trailers, water trucks, trackhoes, backhoes, and

seeders. The water truck will be used to provide dust suppression as needed, and water will come from one of the two production wells.

ROADS

Through final reclamation, the operator will maintain roads as needed to minimize erosion and off-site sedimentation. Such road maintenance will continue until the roads are fully reclaimed.

Roads needed for maintenance access to the water well/pipeline will not be reclaimed. The road segment to the man camp would be deep-ripped to relieve compaction, regraded to blend with site topography, and seeded.

Roads that are not integral to the pits, backfills or OIS storage areas would be reclaimed during final reclamation. These roads would be deep-ripped to relieve compaction, regraded to blend with site topography, topsoiled, and seeded. Except where bedrock is encountered, ripping will be a minimum of 24 inches deep, with ripper shanks spaced no more than 24 inches apart. In shallow bedrock areas, ripping depth may be less than 24 inches by necessity. Roads that are integral to the pits, backfills and OIS storage areas will be reclaimed as part of those features.

HIGHWALLS

No highwalls would remain at the end of mining as pits would be backfilled and/or graded off to blend with the existing surrounding topography.

SLOPES

All OIS storage areas will be graded during placement to a 3H:1V or flatter slope to achieve a stable, natural-looking landscape. While short segments may exceed this overall slope, no portion of the reclaimed slopes will be steeper than 26° and no areas will be so steep as to be unstable, cause safety hazards, encourage erosion, or hinder successful revegetation. The OIS storage areas and backfill areas will be re-contoured to blend with the surrounding terrain, provide a site amenable to revegetation, and minimize runoff and erosion. Concurrent reclamation will take place as portions of these OIS storage and backfill areas are completed. Any surface expression of rock from construction of internal rock drainage corridors will become part of the reclaimed surface, and be similarly topsoiled and seeded.

Safety and erosion control will be of primary focus during reclamation activities. As described further in Section 110.5, available salvaged topsoil will be applied to all areas with the exception of the armored drainage channels. The entire area will be seeded with native species to stabilize the soil, and provide for the post-mining land use.

PITS

Pits would be backfilled to their original volume or higher, with processed solids, and overburden/interburden. Since the pit floors will be backfilled concurrently as part of the mining process, they will not need to be ripped.

The resulting backfill contours will be graded to blend with surrounding topography, topsoiled, and seeded. Thus pits will not be impounding features upon final reclamation.

DRILL HOLES

Any additional exploration holes drilled during Phase 1 mining activities will be plugged and closed as prescribed in R647-4-108.

FACILITIES AND MATERIALS

All of the structures on the plant site will be taken apart and hauled away for reuse, resale or disposal (**Appendix E**). Inert materials, such as gravel, foundations, and small quantities of solids and reject materials would be integrated into the plant area recontouring efforts.

The man camp would be dismantled and all facilities removed. The site would be ripped, topsoiled, and seeded.

The production well and pipeline will be left in place until the operator determines these assets are of no further value to the company, at which time the operator may elect to transfer ownership of these assets including infrastructure, water rights, maintenance and reclamation responsibilities to another appropriate entity. For reclamation purposes under this plan, the operator will cap the water pipelines at the wellheads and underground at the point of connection to the plant (**Figure 11**). The pipelines will be abandoned in place.

Residual materials in the extraction plant equipment will be removed. The equipment will then be removed from the containment areas, disconnected from individual skids, and hauled away. All of the residual material will be separated into solid, aqueous, or hydrocarbon phases. The solid phase can be discharged on site to the mined-out pits, as it consists of the same materials that have already been placed in that area. The aqueous phase will be pumped to a tank or container for off-site disposal. Any remaining bitumen that is not sold to a refinery will be recovered with a vacuum and hauled off-site and disposed of appropriately. No hazardous materials presenting an impact to public health and safety will be disposed on site.

The re-bar reinforced concrete foundation under the warehouse and shop will be fractured to eliminate meteoric water ponding before being covered with native materials.

Non-geologic based liners will be removed from the site and disposed of at an appropriate disposal facility. Retention ponds will be filled or reshaped to blend into the surrounding topography and to prevent future water retention. Reserve, processed solids, and reject rock stockpiles will be loaded into trucks and hauled back to pit where an opening will be made to place unused ore in the backfilled pit. The plant site area will then be regarded, ripped, topsoiled, and reseeded.

Trash removal will occur after all buildings and facilities are removed; it will involve collection of all refuse, litter, stray metal, pipe, wood, insulation, and other debris. The area will be inspected to check for and collect trash.

There will be no shafts or adits, or similar structures that would require reclamation. As noted above under the "Pits" subheading, the pits will not be impounding after backfilling and reclamation.

110.3 Surface Facilities to Remain

The process plant, all associated support facilities, and mining equipment would be removed from the site, unless economic conditions allow for continued mining, in which case the plant site facilities and man camp would remain intact and require separate permitting. The production wells would be capped at the well heads. The water pipeline would remain in place and would be capped underground at the plant site as shown on **Figure 11**.

110.4 Treatment, Location and Disposition of Deleterious Materials

During operations, all new and spent fuel, oil, and lubricants will be stored within secondary containment as required by the SPCC Plan, as further described in the operations - processing, Section 106.2 and **Appendix F**. Any containers and their contents remaining at the end of operations will be removed to a licensed disposal facility prior to reclamation of the plant site. Any hydrocarbon spills that occur during mining operations will be dealt with as outlined in the SPCC Plan, and will not be a consideration during reclamation. Any fuel spills that occur during the reclamation process will be similarly managed.

Any other chemicals, including the solvent, present during operations, will be consumed during operations. Any of the stored substances remaining onsite at the end of mining will be properly removed and disposed of, prior to final reclamation. Any remaining fuels will be used to fuel equipment used in reclamation work. Fuels and liquids remaining after reclamation will be removed for disposal or re-use in accordance with relevant regulations. No acid forming or deleterious material will be left on-site.

110.5 Revegetation Planting Program and Topsoil Redistribution

Table 10, below, shows that all of the Affected Areas other than the well pads and road will be reclaimed by various methods. This includes redistributing topsoil on all areas except those associated with the armored drainage channels and the topsoil storage areas (soils will not have been salvaged on those areas, so original topsoil will remain).

Table 10: Reclamation Treatment Acres

Facility	Affected Area (acres)	Acres to be graded	Acres to be ripped	Acres to be topsoiled	Seeded Acres
Plant Site including Office and Processing facilities	20.6	20.6	20.6	20.6	20.6
Haul roads	11.3	11.3	11.3	11.3	11.3
Pit 1	25.5	25.5	0	25.5	25.5
Pit 2	136.2	136.2	0	136.2	136.2
Pit 3	73.8	73.8	0	73.8	73.8
OIS storage areas	27.5	27.5	0	27.5	27.5
Storm Water Management Areas	6.9	0	0	0	6.9
Topsoil storage adjacent to plant site	1.0	0	0	0 (topsoil already in place)	1.0
Topsoil storage area on pit*	0	0	0	0	0
Subtotal	302.8	294.9	31.9	294.9	302.8
Man camp	4.0	0	4.0	4.0	4.0
Production Well Area					
- 2 well pads	2.7	0	0	0	0
- road/pipeline	6.7	0.8	0.8	0.8	0.8
Subtotal well area	9.4				
Subtotal ancillary area	13.4				
Total disturbance treatment	316.2	295.7	36.7	299.7	307.6

*Areas are integral to pits or OIS storage areas and reclamation treatments are included within those facilities.

SOIL MATERIAL REPLACEMENT

Once final grading is complete on each area that is ready for concurrent reclamation, as described above, topsoil will be replaced using scrapers/trucks and dozers. The majority of the area would have the benefit of either a short storage period or a direct placement from one area where mining is preparing to begin to another area where reclamation is proceeding. This will eliminate the need to store large quantities of topsoil long-term and will preserve its quality.

Topsoil would be placed on the backfilled surfaces of the pit and OIS storage areas (with exceptions as noted previously) as the mining/processing/backfilling sequence allows. Topsoil will be redistributed to about a 4-inch depth with a scraper and/or dozers. Topsoil storage areas will not be topsoiled.

Topsoil will be replaced on the water pipeline disturbance as soon as construction is complete.

Vegetative matter gathered during the topsoil salvage operations and stockpiled as a component of those piles would also be spread along with the topsoil, providing organic matter and helping with soil moisture retention. Any additional salvaged vegetation that was stored in slash piles will be placed and redistributed on reclaimed areas in order to provide organic matter and surface roughness.

Equipment used for this task is likely to be a dozer, scraper, grader, and farm tractor/implements.

SEED BED PREPARATION

After the topsoil has been placed, areas will be disked if needed. This roughening will loosen soils to promote root penetration. A range land seeder equipped with separate seed boxes accommodating various seed sizes will be used to drill or scatter the seed mix into/onto the soils. Alternatively, if a range land seed drill is not available, the seed will be broadcast. Bitterbrush will either be hand seeded and packed into each 'seed hill', or a packer wheel will be used if drill seeded.

The salvaged topsoil will provide a reasonable growth medium for the site. No mulch or fertilizer will be used in reclamation efforts. The final surface will be rough, creating small depressions for water retention sites and habitat niches.

Seed Mixture

A single seed mix (Table 11) will be used for all reclaimed surfaces and is based on sampling results and NRCS ecological site data. Any alterations beyond what is included in the list would require agency approval. All affected acres will be seeded. Seeding will be accomplished as described above. A tractor-pulled broadcast seeder or a range land seed drill will be used on all accessible areas. Smaller broadcast seeding or hand seeding may be required in some areas.

Table 11: Seed Mix

SPECIES	SEEDS/LB	PLS* LB/AC
Forbs -		
Blue flax (*Linum lewisii*)	293,000	0.50
Rocky Mountain penstemon var. Bandera (*Penstemon strictus*)	592,000	0.25
Small burnet (*Sanguisorba minor*)	55,000	1.00
Lupine (*Lupinus caudatus* or *L. alpestris*)	27,600	1.00
Total forbs in seed mix		2.75
Grasses -		
Muttongrass (*Poa fendleriana*)	890,000	.50
Canby bluegrass (*P. canbyi*)	926,000	.50
Indian ricegrass (*Achnaetherum hymenoides*)	150,000	2.00
Great basin wildrye var. Magnar (*Leymus cinereus*)	130,000	1.00
Bluebunch wheatgrass (*Pseudoroegneria spicata ssp. spicata*)	140,000	1.50
Western wheatgrass (*Pascopyrum smithii*)	110,000	1.50
Total grass in seed mix		7.00
Shrubs -		
Sagebrush – Wyoming or Mountain (*Artemisia tridentata wyomingensis or vaseyana*)	2,500,000	0.25
Bitterbrush var. Lassen (*Purshia tridentata*)	15,000	2.00
Serviceberry (*Amelanchier alnifolia*)	25,800	1.00
Snowberry (*Symphoricarpos oreophilus* or *S. albus*)	75,000	1.00
Total in shrubs in seed mix		4.25

Total pounds of seed applied per acre: 14.0 PLS lb/ac

* PLS = Pure Live Seed

Seeding Method

The seed mix will be drilled with a range land seeder equipped with separate seed boxes or be broadcast seeded or hand seeded as described above, on all areas that will be reclaimed, including OIS storage area slopes and pit slopes. Revegetation work, including both seedbed preparation and seed application will take place in the late fall season and seed would be spread as soon as possible following seedbed preparation.

Other Revegetation Procedures

As noted throughout this document, all reclaimed slopes will be stabilized by leaving them at a 3H:1V or flatter and leaving them in a very roughened form to maximize infiltration and minimize runoff. It is important to note that there will be little to no run-on on these reclaimed surfaces.

All erosion control BMPs will be utilized during concurrent reclamation as well as the time from seeding up through the time when vegetation is successful.

The operator will monitor for noxious weeds, and would provide weed control measures according to County directives should noxious weeds pose a potential problem. This will be done in the early summer months each year after reclamation until bond release has occurred. The monitoring would consist of a site visit by a person familiar with the potential noxious weeds, and a simple visual walk around the reclaimed areas. If any Noxious weeds are identified, the County would be informed of their extent, and actions taken as directed by them.

Further, the operator would qualitatively and visually monitor revegetation success for the first two years after reclamation, during the growing season. During the third summer, quantitative surveys, following the appropriate Division guidelines, will be conducted to assess revegetation success. This will determine whether revegetation has achieved 70 percent of the pre-mining cover, and survived after three growing seasons, as required by R647-4-111.13.11.

110.6 Statement

The operator would conduct reclamation as required under the Utah Rules R647-4.

R647-4-112. Variance

No variances are being requested for this mining operation.

R647-4-113. Surety

A reclamation surety estimate will be provided to the Division and placed in **Appendix E.** The calculated bond is for the Affected Area delineated by the "Disturbance Limit Boundary" and described in text and as shown on the figures.

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gradient to the north. As noted above, this was confirmed by the operator's two production wells, located within about one mile of the Phase 1 project area. (One of those wells intercepted a small amount of water at a depth of about 670 feet, which is about the same elevation as the nearby Main Canyon floor.)

At their maximum depth of approximately 150 feet below ground surface, none of the three Phase 1 pits are expected to encounter or approach this regional groundwater table. Further, because mining occurs on the hydrologically isolated interfluve between PR and Main Canyon, the Phase 1 mining will not affect groundwater gradient or quality. Litigation challenging the definition of ground water in this area was eventually dismissed by the Secretary who determined that there was only a limited amount of shallow, localized ground water at the site that is not part of a regional aquifer system (Supreme Court of the State of Utah opinion 2014 UT 25).

The operator's use of up to 360 acre-feet per year of groundwater obtained from the two production wells that intercept the deep regional aquifer will not adversely impact the local groundwater regime. Water usage is estimated at approximately 168,480 gallons per day and 61.5 million gallons per year (189 acre-feet). The wells draw from the deep, low quality regional aquifer that is not a source for natural surface expressions or other wells in the region. The State Engineer confirmed this absence of connectivity in early 2014 in resolving a protest on a temporary change application to allow additional uses and places of use associated with the water right. The State Engineer found that neither production well is impacting a spring in the bottom of Main Canyon located approximately 3/4 mile south of one of the production wells and which discharges at an elevation of 7,440 (approximately 1,000 feet higher than the static water level in the wells).

The operator and DWQ have reviewed the project's Permit by Rule coverage under DWQ's Groundwater Protection Program. DWQ continues to support the *de minimus* impact of the project (including the planned pit backfills with processed solids) on groundwater resources. Copies of related correspondence are included in **Appendix B**.

In July of 2015 the Division of Oil, Gas and Mining requested that the operator submit an amendment to this NOI to establish a monitoring program for potential effects to the possible subsurface water system. Copies of the related correspondence, the associated spring and well evaluations and the full detailed monitoring program are included in **Appendix B**.

The monitoring program includes monitoring of USOS's deep water wells PW-1 and USO-5 (see Figure 2) and a total of four springs depending upon granted access and flow. Three of the springs are located in Main Canyon, 32-1, 31-1 and 6-1 (see Figure 1.1 in the Appendix B water monitoring program). The fourth spring is PR Spring located adjacent to Seep Ridge Road (see Figure 1.1 in the Appendix B water monitoring program).

The parameters to be monitored at the wells and at each spring are: Flow, Total Dissolved Solids (TDS), pH, basic anions and cations and a d-limonene tracer (the solvent used in the process). The frequency of monitoring will be three times a year for the first two years, and twice a year thereafter. Summary reports will be submitted to the Division of Oil, Gas and Mining upon request and/or annually with the annual mining progress reports.

WATER RIGHTS

According to online records of the State Engineer's Office, (Utah Division of Water Rights) there are a number of water rights in the region, as shown in Table 8 and on **Figure 9**. None of these would be affected by the operator's operations.

Table 8: Water Rights

Water Right No.	Water Source	Quantity (cfs)	Use	Water Right Owner
49-55	Unnamed Spring	0.002	Stock watering	John S. Purdy
49-57	PR Springs	0.002	Stock watering	John S. Purdy
49-193	Unnamed Spring	0.025	Stock watering	Alameda Corp.
49-196	PR Springs	0.021	Stock watering	Alameda Corp.
49-262	PR Springs	0.011	Domestic & stock watering	BLM
49-495*	Meadow Spring	0.015	Stock watering & wildlife	SITLA
49-496*	South PWR Meadow Spring	0.015	Stock watering & wildlife	SITLA
49-497*	North PWR Meadow Spring	0.015	Stock watering & wildlife	SITLA
49-498*	West Willow Reservoir #3	0.25	Stock watering & wildlife	BLM
49-499*	West Willow Reservoir #2	0.25	Stock watering & wildlife	BLM
49-500*	PR Reservoir	0.25	Stock watering & wildlife	BLM
49-504*	Jacks Canyon Spring	0.015	Stock watering & wildlife	BLM
49-1504	Unnamed Spring	0.05	Stock watering	SITLA
49-1505	Unnamed Spring	0.05	Stock watering	SITLA
49-1506	Unnamed Spring	0.05	Stock watering	SITLA
49-1508	Unnamed Spring	0.05	Stock watering	SITLA
49-1512	Horse Canyon Unnamed Spring	0.05	Stock watering	SITLA

Most of the haul roads will be integral or adjacent to the pits, OIS storage areas, and backfill areas. Additional erosion control is not required in these areas. As needed, however, some haul roads may be ditched, to intercept and transport water to appropriate storm water ponds. The SWMP (**Appendix G**) provides more details on these road runoff and erosion control features.

The plant site will be constructed to be internally draining through the use of perimeter berms or ditches as needed to direct runoff. All precipitation incident on the site (except for precipitation that falls directly into one of the secondary containment structures for the tank farm and non-hydrocarbon liquid storage areas or the process sump) will be collected in the storm water retention pond located at the low point of the plant site (**Figure 3a**). Sediment production from the plant site will be negligible, due to gradient and surfacing. Any sediment transported in runoff would eventually make its way to the storm water retention pond, which will be cleaned of sediments as needed. Sediment will be hauled to the backfill or OIS areas.

The man camp location is crowned such that the living areas are at the high point of the camp. Drainage is generally to the southeast and the site is designed so that no high velocity runoff channels would promote erosion of the camp area or adjacent land. Camp staff will monitor the perimeter of the camp area for signs of erosion or other water damage. The northwest side of the camp pad and access road are each constructed with drainage ditches along the perimeter of the structures to prevent water from pooling on the access road or along that side of the camp.

All BMPs will be regularly inspected, and maintained in operable condition. These above-noted types of BMPs are also described in the SWMP, which is included in **Appendix G**.

AIR QUALITY

The Phase 1 Project does not require either state or federal permits. However, the Project incorporates mechanisms and best management practices to minimize potential air quality impacts, including the following:

- Fugitive dust from stripped lands, the mine pit, OIS storage areas, backfill, and topsoil stockpiles.
- Fugitive dust from the plant site area and ore stockpiles.
- Emissions from the equipment used to mine, haul and separate bitumen from the ore.
- Fugitive dust from newly reclaimed lands.

The Phase 1 Project is located primarily in Uintah County, although portions of Pit 1 and Pit 2 are located in Grand County. The portion of the Project in Grand County is subject to the jurisdiction of the Utah Department of Environmental Quality, Division of Air Quality (Utah DAQ). The remainder of the Project in Uintah

County, including portions of Pit 1 and Pit 2, all of Pit 3, and the entirety of the Plant area, are within the boundaries of the former Uncompahgre Indian reservation which has been determined by the federal courts to be Indian Country and is therefore subject to EPA jurisdiction.

USOS calculated the potential emissions from equipment in the Plant area and those emissions are below federal permitting thresholds for minor sources operating in Indian Country. *See* 40 CFR Part 49 (Federal Minor New Source Review Program in Indian Country). The only non-fugitive emissions from the Project will result from the onsite diesel-fired generator, natural-gas fired generators, and process heaters. USOS has assessed the facility's potential emissions based on maximum process rates and the manufacturers' guaranteed emission factors for this equipment. Consistent with federal requirements, the operator will submit to EPA a registration of its emission sources with actual emissions within 90 days of beginning operations. 40 CFR 49.160(c)(1)(ii).

The portion of the Project in Grand County only has the potential to generate fugitive emissions, which are subject to state best management practices. Utah DAQ requires mining operators to develop best management practices to reduce fugitive dust associated with mining activities, including control measures designed to minimize fugitive dust during site preparation, mining, and reclamation operations. Utah Administrative Code R307-205-7 (requiring minimization of fugitive dust from mining activities). A fugitive dust plan that ensures compliance with these requirements is in place and USOS has extended these state requirements to the entire Project, including the areas that are not within the jurisdiction of Utah DAQ. An overview of the best management practices included in the fugitive dust plan are set forth below:

- The fugitive dust will be minimal from ore piles as the oily consistency of raw ore does not allow it to readily become airborne. Overburden and interburden may or may not be moist, depending on current weather conditions. Once the oil is removed from the ore, clean processed solids remain. As the solids from the plant will be damp-dry (less than 20 percent moisture), wind generated air borne particles are expected to be minimal but will be actively monitored; if necessary, water trucks will be utilized to reduce and control any fugitive dust.

- Haul roads will be sprayed regularly with water from a water truck. Water will be obtained from one of the production wells, in-pit storm water sumps or the processing plant storm water pond. Roads that are in use during most or all of the Phase 1 project may be paved with sub-grade ore to aid in dust suppression. Portions of the plant site may be similarly paved with sub-grade ore.

CULTURAL RESOURCES

U.S. OIL SANDS, INC.

PR SPRING MINE
WATER MONITORING PLAN

PER 2014 REVISED NOTICE OF INTENTION TO COMMENCE LARGE MINING OPERATIONS

PR SPRING MINE
UINTAH AND GRAND COUNTIES, UTAH

(HAL Project No.: 366.02.100)
SEPTEMBER 22, 2015 (Updated)

Project Manager

HANSEN ALLEN & LUCE INC
ENGINEERS

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1.0 INTRODUCTION

U.S. Oil Sands, Inc. (USOS) has submitted an application for an oil sand mining project (Project) in Uintah and Grand Counties, Utah, approximately 65 miles southeast of Roosevelt, Utah. In a letter dated July 17, 2015, the Utah Division of Oil, Gas and Mining gave final approval for the project conditioned on USOS "amending the Notice of Intention to Commence Large Scale Mining Operations (NOI) to (1) establish a monitoring program for potential effects to the possible subsurface water system, and (2) include further evidence of the Operator's compliance with the appropriate air quality regulatory authority or authorities". This Monitoring Plan (Plan) is submitted to address Condition 1 of the Decision. In general, the purpose of the monitoring program is to provide short and long term data to show De Minimis impact to the ground water system as a result of mining operations. This will be accomplished through the following activities.

- The monitoring and recording of water quality from two on-site USOS wells water production wells.
- The monitoring and recording of spring water discharges and water quality.
- The scheduled review of the data to evaluate impact to the local subsurface water system, if any.

Existing water sources were reviewed and evaluated for inclusion in the monitoring program, including existing ground water wells and local springs. Spring 6-2, noted during the DOGM informal hearing held on June 30, 2015 is a spring source located within the upper reaches of Main Canyon was originally intended to be included within the monitoring program. The owner of the land and spring was contacted during a June 9, 2015 site visit wherein permission was granted to visit the spring. However, a repeated attempt to gain access to and monitor the spring as part of this monitoring plan has been rejected. The owner will no longer allow access to the spring. Since spring 6-2 is located on private land and is inaccessible to monitoring it has been eliminated from inclusion in the monitoring plan. Spring 6-1 has instead been included within the plan as shown. The location of the mining operation along with wells and springs to be monitored are shown on Figure 1.1. A discussion of each of these water sources follows.

1.1 SUBSURFACE WATER INVENTORY

Subsurface water sources, including potential ground water aquifers, wells, and springs have been reviewed, documented and evaluated as part of the mine permitting process.

Shallow Aquifers. Significant geologic data, including the vast amount of data gleaned and developed by USOS through the drilling and exploration of dozens of exploratory wells has been submitted by USOS as part of the permitting process. The collection of this data has provided the basis for a clear understanding of local hydrogeology. Two basic conclusions reached through this exploration are that 1) there is no identifiable water zone or aquifer identified within the proposed mine area to depths of at least 350 feet, and 2) the geologic strike and dip is to the north-northwest. Based on these findings and documented conclusions, there are no sustainable aquifers that have been identified within the area to be mined.

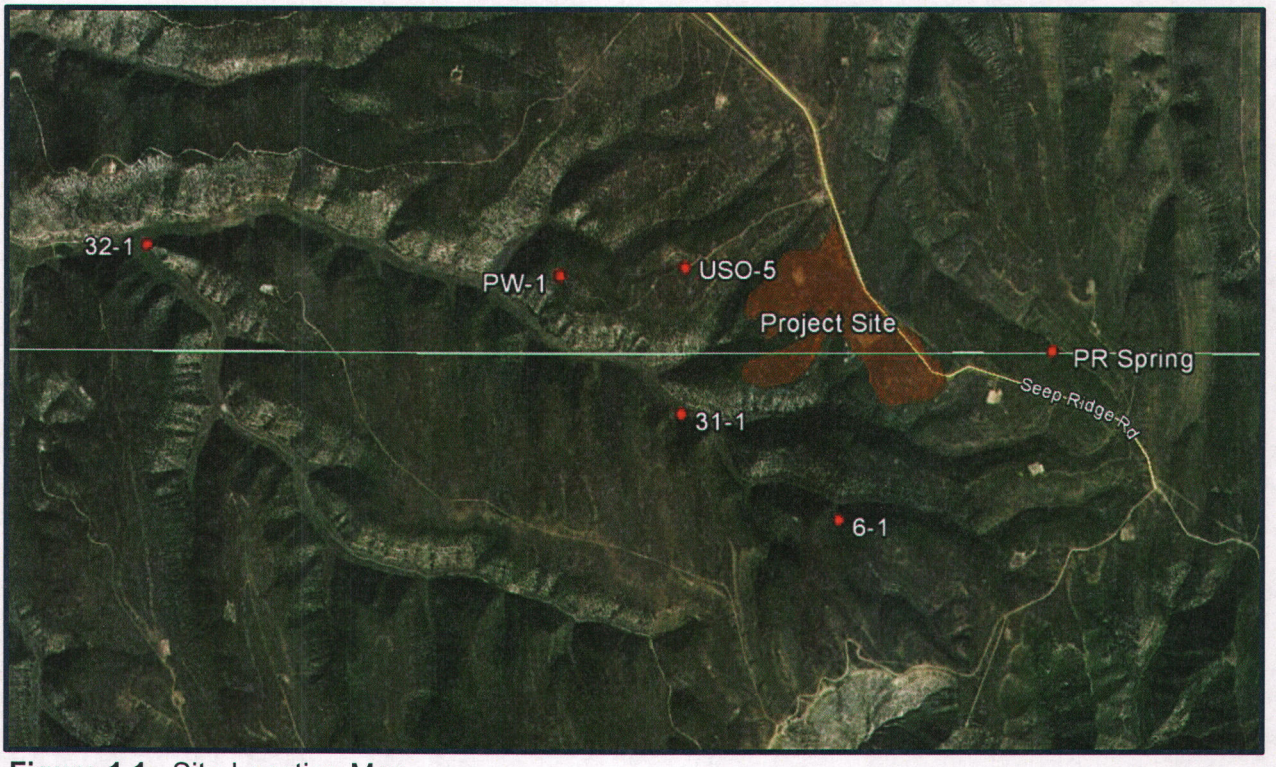

Figure 1.1. Site Location Map

Wells and Deep Aquifers. Local ground water has been encountered at depth within USOS's wells PW-1 and USO-5, which are in excess of 2,500 feet deep (see Figure 1.1 for location). No other producing wells are known to exist within the project area and vicinity. General information related to these USOS wells is provided in Table 1.1. Latitude and Longitude information was taken from Google imagery using the WGS84 datum.

Table 1.1. Well Data

Well #	Depth (ft)	Dia (in)	Top of Casing Elevation (msl)	Static Water Level (msl)	Latitude	Longitude
PW-1	2,549.7	10	7,880.9	6,367.9[1]	N 39° 28.072'	W109° 19.843'
USO-5	2,600.0	5.5	8,043.0	6,347.0[1]	N 39° 28.107'	W109° 19.130'

1) Data taken 9/22/2012

The main purpose of these two USOS wells is to provide the water source needed for mining and processing operations. However, they have been incorporated into the monitoring plan to document water quality at depth northwest and west of the mine area. Water quality data from the deep wells will be useful for confirming the lack of connectivity between mining operations and deep ground water.

Springs. Only a few isolated springs have been identified and documented within the permit application and adjacent area. Springs to be included in the monitoring plan are shown in Figure 1.1. These local and adjacent springs include PR Spring located east of the mining operation, two springs (31-1 and 32-1) located south and west of the mining operation within Main Canyon, and spring 6-1 (water right 49-1563) located in a tributary to Main Canyon south

of the mine. Springs 31-1 and 32-1 are located on property owned by Mr. Burt DeLambert, spring 6-1 is a spring owned by the State Institutional Trust Lands Administration (SITLA), and PR Spring has public access. Table 1.2 provides the GPS coordinates for these four springs which were collected using a Garmin Rino 530 GPS unit during site visits by Dr. David Hansen of Hansen, Allen & Luce, Inc. on June 9, 2015 and August 19, 2015, again using a WGS84 datum. Photographs of each spring taken during the site visits are shown in Photos 1.1, 1.2, 1.3 and 1.4.

Table 1.2. Spring Location Data

Spring	Latitude	Longitude
PR Spring	N 39° 27.716'	W109° 17.052'
6-1	N 39° 27.004'	W109° 18.248'
31-1	N 39° 27.467'	W109° 19.152'
32-1	N 39° 28.217'	W109° 22.269'

Photo 1.1. PR Spring Looking Southwest

Photo 1.2. Spring 6-1 Looking East

Photo 1.3. 31-1 Spring Looking East

Photo 1.4. Spring 32-1 Looking Southeast

1.2 SITE VISIT OBSERVATIONS

A complete discussion of site observations and conclusions made during the June 9, 2015 site visit are documented in the memorandum included within Appendix A. The memorandum documents the locations of each spring visited, its condition, and its source. The August 19, 2015 site visit was conducted for the purpose of observing each of the spring sampling locations with April Abate of DOGM. Springs visited on August 19th included 31-1, 32-1, 6-1 and PR Spring. Without exception, all springs were found to be emanating from an east or south bank, either east, south or west of the project area. It was also clearly observed that PR, 32-1 and 6-1 springs issue at a geologic interface on top of confining bedrock. It is believed that similar conditions would be found related to Spring 31-1 if the soils which have accumulated at the spring were removed. For the above reasons it is firmly believed that all noted springs are hydrologically disconnected from the project area. The general conclusion for each spring, and a general summary as documented within the memorandum included in Appendix A are as follows.

> ***PR Spring.*** *"The recharge area for PR Spring is believed to be to the south and east and in my opinion will not be affected by the proposed mining operation outlined in the permit."*
>
> ***Spring 31-1.*** *Although this spring was not flowing in June 2015, the "recharge area for Spring 31-1 is from the south and east and is hydrologically separated by Main Canyon from the mining operation. There is no possible hydrologic connection between Spring 31-1 and the proposed mining operation outlined in the permit."*
>
> ***Spring 32-1.*** *"All springs in and around the area of 32-1, including the small spring located west of 32-1 were found along the south and east sides of the alluvial valley, at the base of the adjacent hillsides, and at bedrock interfaces. Recharge to these Spring and Seep areas is believed to be from the south and east, and in my opinion is hydrologically disconnected from and will not be affected by the proposed mining operation outlined in the permit.*
>
> ***General Summary.*** *"Based on my field investigation I find no potential hydrologic connection(s) between the U.S. Oil Sands project and any of the springs investigated on June 9, 2015 as documented within this memorandum."*

Conclusions related to Spring 6-1 at the time of the site visit are similar in nature in that the spring is separated from the mining operation by two major side channel drainages, and is located in a north-south tributary with flows issuing from the west facing slope. Recharge is from the south and/or east. There is no possible hydrologic connection between Spring 6-1 and the proposed mining operation outlined in the permit.

Although it is believed that there is no connection between the mining operation and the springs, this monitoring plan has been developed to confirm this through the monitoring and evaluation as defined herein.

2.0 MONITORING PLAN

Subsurface water conditions will be monitored through the collection of data from USOS water production wells and from area springs as discussed in Section 1.0. The monitoring sources, proposed monitoring parameters, and schedule are discussed below.

2.1 MONITORED WATER QUALITY PARAMETERS

The purpose of the monitoring program is to identify potential mining impacts, if any, upon the local ground water hydrologic system. To do this the plan has been developed to include those water quality parameters which will 1) develop a base data set (Phase I Monitoring) documenting natural conditions prior to any potential impact by the mining operation which will help identify and classify the waters within the natural system, and 2) monitor any hydraulic connectivity between the mine and the water sources through the monitoring of a key water quality tracer (Phase II Monitoring). Under this monitoring plan a two year time frame is proposed for Phase I Monitoring. Phase II Monitoring will continue following Phase I Monitoring.

Phase I Monitoring will provide base water quality conditions at all sources due to their remote locations and distances from initial mining operations. Spring 6-1 is located approximately 5,400 feet from the first area to be mined near the plant site. Using a permeability of 1 meter per day (3.21 fpd) for the Green River Formation[1], the time of travel to this spring would be 1,682 days, 841 days if the velocity is double. Given this time of travel, base conditions can be determined within the Phase I Monitoring period.

Parameters selected to achieve this objective include Total Dissolved Solids (TDS), pH, basic cations including Sodium (Na), Calcium (Ca) and Magnesium (Mg), basic anions including Bicarbonate (HCO_3), Sulfate (SO_4) and Chloride (Cl), and d-limonene (the product used during the oil separation process). The purpose for each of these parameters is as follows. Diesel organics are not proposed to be sampled or monitored as part of this plan as 1) they are present naturally and 2) it would be difficult to impossible to distinguish variations due to mining activities.

TDS and pH. These parameters will be monitored to detect basic changes in quality resulting from the mining operation. TDS will monitor changes in dissolved solids and pH will monitor changes in acidity.

Anions and Cations. These parameters will be monitored during Phase I Monitoring to evaluate variations in general water quality for the purpose of potentially verifying different water sources for the sampled locations, and to document natural conditions. Anions and cations are not proposed to be monitored long term as it is felt they do not offer significant contribution to a determination of mining impact, the purpose for the monitoring program.

d-limonene. ChemTech-Ford laboratories (ChemTech) in Midvale, Utah was provided a new untouched sample of d-limonene, the product to be used in the process. ChemTech ran tests in August 2015 on the product using the semivolatile protocols (Method 8270) and determined that this is the best method to detect d-limonene. Using this method, and with a minimum 30 mL sample, ChemTech can detect to a limit of 5 ppb.

[1] Characterization of Oil Reservoirs in the Lower and Middle Members of the Green River Formation, Southwest Uinta Basin, Utah, AAPG Rocky Mountain Section Meeting, Laramie, Wyoming, September 2002.

Sampling protocols to be used for include the following:

1. Although only a 30 mL sample is required for the test, a minimum ½ pint sample will be collected.
2. No preservative is required.
3. Samples are required to be collected in Glass bottles.
4. The bottles are to be Amber in color, not clear to protect the integrity of the sample.
5. ChemTech will provide the sample bottles.
6. Samples must be received in a timely manner so that the product can be extracted by the lab within 7 days of collection. Therefore, samples will be scheduled for a Monday thru Wednesday so that they can be shipped and received by the lab during the work week.

USOS is the only local mining operation known to use d-limonene in their process. As such, the use of d-limonene as a tracer element and the fact that it can be easily sampled and detected is ideal. As such, testing for this element at each sampling location will document any connection or lack of connection with the mining operation.

Water quality samples will be collected from each site according to the schedule shown in Table 2.1.

Table 2.1. Water Quality Parameters[1]

Source	Phase I Monitoring 0 - 2 Yrs	Phase II Monitoring > 2 Yrs
PW-1 Well[2]	TDS pH Anions – HCO_3, SO_4, Cl Cations – Ca, Mg, Na d-limonene Tracer	TDS pH d-limonene Tracer
USO-5 Well[2]		
PR Spring		
6-1		
31-1		
32-1		

1. Collection contingent upon obtaining permission from private land owners granting continued access to the spring source.
2. A single combined well sample is to be collected unless d-limonene is detected, then the samples will be taken independently.

Source water from wells PW-1 and USO-5 are combined prior to usage at the plant. Because of this only a single sample will be collected from these combined sources. If however, d-limonene is detected from the combined well sample, separate samples will be taken thereafter at each source before the flows are combined to determine from which well the d-limonene originated.

2.2 SAMPLING FREQUENCY

Flow. The frequency for flow sampling is provided in Table 2.2. Water flow from the project's production wells and flow at each spring during Phase I Monitoring will be measured three times per year since winter access will be limiting. The three samples are proposed during the spring, summer and fall periods. Bi-annual monitoring is proposed after 2 years.

Table 2.2. Water Flow Monitoring Frequency

Source	Phase I Monitoring (0 - 2 Yrs)		Phase II Monitoring (> 2 Yrs)	
	Flow	Water Level	Flow	Water Level
PW-1 Well	Spring (Mar – May) Summer (Jun – Jul) Fall (Aug – Oct)		Bi-Annually (Mar – Jun) (Jul – Oct)	
USO-5 Well				
PR Spring				
6-1[1]				
31-1[1]				
32-1[1]				

1. Contingent upon obtaining permission from private land owner to grant access to the spring source.

Data from wells and springs will be collected and monitored on an ongoing basis and all data collected shall be submitted annually to the Division of Oil, Gas and Mining. Data collected from private springs 6-1, 31-1 and 32-1 shall be shared with the owners of said springs if requested.

Quality. Water quality parameters identified in Table 2.1 will be collected each time a flow is taken per the sampling frequency shown in Table 2.3. Data collected will provide needed information to confirm water quality impact to any of the identified water sources. Consideration was given to shorter time frames but a reduced frequency is considered unwarranted given the distance and overall attenuation and travel time between the mine and the individual monitored source.

Table 2.3. Water Quality Monitoring Frequency

Source	Phase I Monitoring (0 - 2 Yrs)	Phase II Monitoring (> 2 Yrs)
PW-1 Well	Spring (Mar – May) Summer (Jun – Jul) Fall (Aug – Oct)	Bi-Annually (Mar – Jun) (Jul – Oct)
USO-5 Well		
PR Spring		
6-1[1]		
31-1[1]		
32-1[1]		

1. Collection contingent upon obtaining permission from private land owner to grant access to the spring source.

2.3 SUNSET CLAUSE

At this discretion of USOS, at cessation of mining, or if it is found after 10 years of mining and each 10 years thereafter, that there has been no identifiable impact upon local springs, a request may be made to the Division to terminate the requirement for ongoing monitoring. Any request filed will be based on a re-evaluation of all data collected to date by an independent Civil Engineer with at least 10 years' experience specializing in both surface and ground water hydrology. Following the receipt of said independent re-evaluation, the Division will consider and either accept or deny the request.

3.0 REPORTING

3.1 DATA EVALUATION

Data collected as part of this Plan will be submitted to DOGM at any time upon request. As a routine part of this monitoring plan the data will be summarized annually in a memorandum report during the first quarter of the year and submitted to DOGM. The annual report will include the following information.

1. DATA
    a. Raw well and spring flow.
    b. Raw water quality field data and laboratory test results.
    c. Graphed flow and water quality data.

2. EVALUATION
    a. An evaluation and statement of discharges, water quality and noted changes, if any.
    b. A discussion regarding the presence or absence of d-limonene at each monitoring location and the hydraulic connection between the mine site and each tested source based on the presence or absence of d-limonene in analyzed samples.

Appendix A

Summary Report

Field Observations and Conclusions Based on June 9, 2015 Site Visit

(Updated September 22, 2015)

SUMMARY REPORT
Field Observations and Conclusions
Based on June 9, 2015 Site Visit
(Updated September 22, 2015)

SUMMARY MEMORANDUM:

This memorandum summarizes the site visit conducted by Dr. David E. Hansen at the U.S. Oil Sand Project Site on the Tavaputs Plateau, Utah on June 9, 2015. This update re-names spring locations identified to prevent confusion between this report and reports prepared by others. The site visit was conducted to visually review and/or confirm findings and observations documented by Hansen, Allen & Luce, Inc. (HAL) in April 2015 of the "Hydrogeochemistry of Perennial Springs on the Tavaputs Plateau, Utah, USA: Significance to Tar Sand Mining, Processing, and Disposal of Adjacent Ridges, January 30, 2015."

INTRODUCTION

Dr. David Hansen met with Doug Thorton the morning of June 9, 2015 to discuss the overall oil sand project and spring access points. Contact was made by Mr. Thorton with the rancher located in Main Canyon for permission to access the lower spring sites near the ranch house and Main Canyon reservoir. Springs visited and referenced herein are numbered as shown in Figure 1. PR Spring is located approximately 0.55 miles east of the project site within PR Canyon and Springs 6-2, 31-1 and 32-1 are located within Main Canyon south of the project site. Spring 6-2 is located farthest up canyon, 31-1 is located approximately 0.8 miles downstream of 6-2, and 32-1 is located approximately 0.3 miles up canyon from the reservoir located near the ranch house.

All four springs were visited on June 9, 2015 where photographs were taken and GPS locations documented using a Garmin Rino 530 GPS unit. Discussions related to each spring follow.

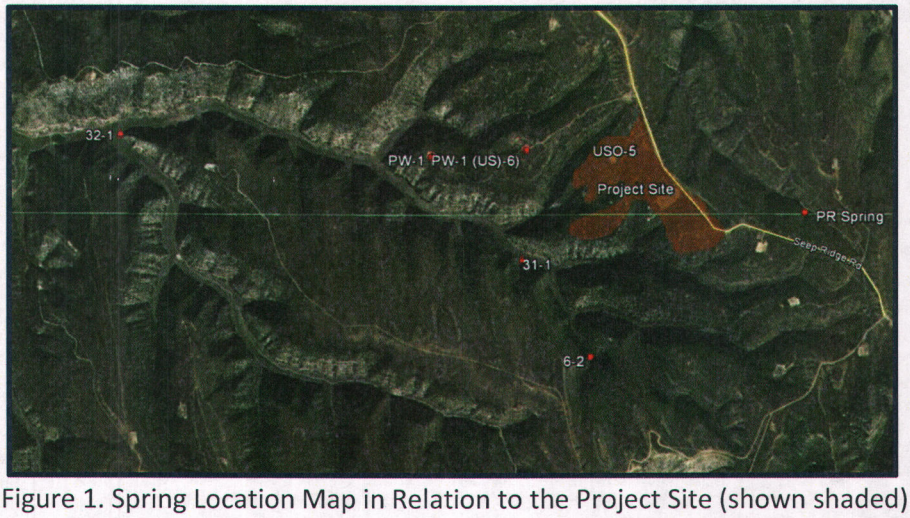

Figure 1. Spring Location Map in Relation to the Project Site (shown shaded)

OBSERVATIONS

PR Spring

The coordinates for PR Spring are 39° 27.716'N, -109° 17.052'W. The spring discharges from the east side of a small side drainage of PR Canyon near the ridge line at the location shown in Figure 2.

Figure 2. PR Spring, Overflow and Drinking Water Faucet

Photos 1 thru 4 below taken during the site visit show the general layout of the spring and facilities. Photo 1 was taken from the parking area and shows the public drinking water faucet in the foreground, the wet area which has been created by the tank overflow or additional local seepage, and the spring collection area near the upper middle portion of the photograph. Photo 2 shows the spring collection area and appurtenant facilities. Photo 3 shows what is believed to be the overflow from the storage tank located within the spring collection area. It would appear that without any demand on the faucet, the overflow represents the amount of water issuing from the spring which at the time of the site visit was approximately 1 gpm. Photo 4 shows the spring collection area looking north.

Photo 1. PR Spring, Overflow and Faucet

Photo 2. PR Spring Collection Area Looking So.

Photo 3. PR Spring Tank Overflow

Photo 4. PR Spring Looking N.

General Conclusion

The recharge area for PR Spring is believed to be to the south and east and in my opinion will not be affected by the proposed mining operation outlined in the permit.

Spring 6-2

Access to this spring from the east is limited by a locked gate at the property line of the local land owner. However, access was granted by the land owner via a phone call made from the ridge above PR Spring. The coordinates for Spring 6-2 are 39° 26.903'N, -109° 18.640'W. The spring discharges from the east side of the drainage (west facing slope) of Main Canyon near the intersection of a small side drainage. It is located approximately 15 vertical feet above the channel bottom. Without significant local landmarks an aerial image of the spring location does little more than that shown in Figure 1. Photographs however taken during the site visit however provide valuable information.

The spring has been developed by the local land owner and is piped approximately 1,700 feet to his cabin and development. Photo 5 was taken looking east and shows the crude log fence that has been constructed to protect the spring. Photo 6 shows the spring itself, the great majority, if not all of the

flow, was coming from the small concentrated area shown in the photograph. The spring issues along the interface of the bedrock formation shown in Photo 6. Documentation of this bedrock is also seen in Photo 7 where the spring was noted to issue near the top of the photograph above the layered bedrock to the right of the vegetation.

Photo 5. Spring 6-2

Photo 6. Spring 6-2 Discharge Area

Photo 7. Spring 6-2 Rock Interface

General Conclusion

The recharge area for Spring 6-2 is from the south and east and is separated by two major side channel drainages from the mining operation. There is no possible hydrologic connection between Spring 6-2 and the proposed mining operation outlined in the permit.

Spring 31-1

Access to Spring 31-1 from the south was also limited by the locked gate referenced within the discussion for Spring 6-2. However, as noted above access was granted by the land owner to access the spring. The coordinates for Spring 31-1 are 39° 27.467'N, - 109° 19.152'W. The spring is located along the south side of Main Canyon at the base of the hillside at the location shown in Figure 3. The Main Canyon drainage channel (located approximately 60 to 70 feet north of the spring) is well incised with the flow line being approximately 10 to 15 vertical feet below the spring. With the deeply incised channel in close proximity, it is unlikely that the spring is related to shallow alluvial waters within Main Canyon, but more likely to recharge from the south and east.

Figure 3. Spring 31-1

At the time of the site visit the spring was found to be undeveloped and dry. Photo 8 was taken looking east toward the spring. The tree shown in the upper right portion of the photograph is located at the base of the north facing hillside. Photo 9 shows the spring in relation to Main Canyon and the incised channel which is located at the far left of the photograph just to the left (north) of the sagebrush which borders the south bank of the Main Canyon channel.

Photo 8. Dry Spring 31-1

Photo 9. Spring 31-1 and Main Canyon

General Conclusion

The recharge area for Spring 31-1 is from the south and east and is hydrologically separated by Main Canyon from the mining operation. There is no possible hydrologic connection between Spring 31-1 and the proposed mining operation outlined in the permit.

Spring 32-1

The coordinates for Spring 32-1 are 39° 28.217'N, - 109° 22.269'W. The spring discharges at the confluence of Main Canyon and the side drainage to the south, and is located respectively along the south and east edges of the valley fill as shown in Figure 4. Not previously noted in documentation reviewed by HAL is the presence of two additional spring areas adjacent to 31-1, and one smaller spring located approximately 1,000 feet west of 32-1. Water from Spring 32-1, located within the fenced area, is collected and discharges from the pipe shown in Photo 10.

Figure 4. Spring 32-1 and Small Spring

Photo 10. Panorama View of Spring 32-1 Looking East to South.

Figure 5 shows a blow up of the 32-1 area which can be seen as the fenced area in the figure. According to the property owner Spring 32-1 was developed prior to his purchase of the property.

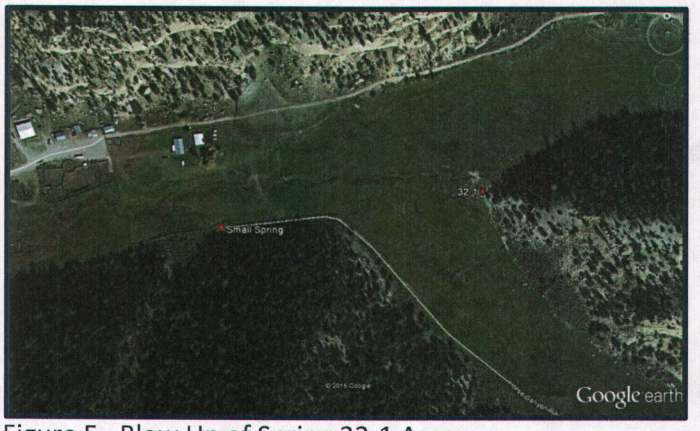

Figure 5. Blow Up of Spring 32-1 Area

Subsequent to his purchase of the ranch, the owner had difficulty working a bulldozer within the area south of 32-1 due to wet conditions. To better access the area he developed what was found to be a small spring located adjacent to the hill just south of Spring 32-1 (bottom area of the photo). Development of this seep area dried up the surrounding land allowing better access. This spring is piped and discharges to the area noted as the "Seep Discharge". The discharge from this seep is shown in Photo 11.

Photo 11. Small Seep Discharge South of 32-1.

Another spring, located at the base of the hill approximately 125 feet east of 32-1 was also historically developed to supply water to the ranch house(s). Although unmarked, the pipeline scar is clearly noted angling upward from right to left in the top portion of Figure 5.

A previously unidentified spring (Small Spring) was also noted during the site visit at the location shown in Figure 4. The spring is located directly south of the main ranch house and across Main Canyon. The property owner indicated that the spring flow from this source has been very consistent over the years and is "as good as it has ever been". He also indicated that the spring was originally piped to the historic ranch house but had inadequate pressure and was therefore abandoned for that purpose. It is now used for livestock watering. The spring, which issues from a badly deteriorated pipe, is shown in Photo 12 was noted to be riding out on top of bedrock. The concrete encased pipe noted in the center of the photograph is believed by the owner to have broken off and separated from the spring discharge after years of deterioration and impact by livestock.

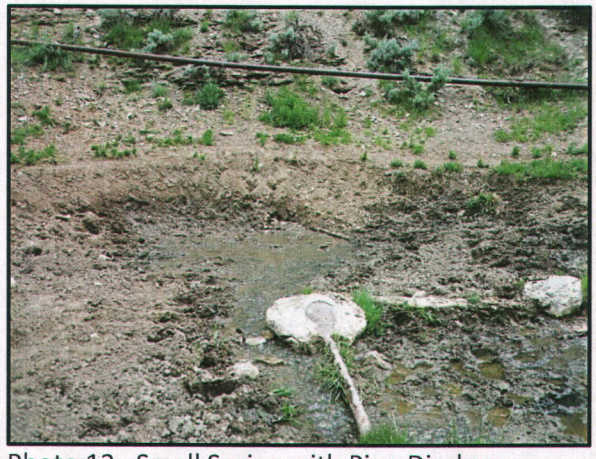

Photo 12. Small Spring with Pipe Discharge.

General Conclusion

All springs in and around the area of 32-1, including the small spring located west of 32-1 were found along the south and east sides of the alluvial valley, at the base of the adjacent hillsides, and at bedrock interfaces. Recharge to these Spring and Seep areas is believed to be from the south and east, and in my opinion is hydrologically disconnected from and will not be affected by the proposed mining operation outlined in the permit.

Possible Well Impacts

A discussion with the Rancher in Main Canyon revealed that it has been his concern that the exploratory wells and current deeper production wells have impacted local spring flows. This is not believed possible for the following basic reasons.

1. None of the exploratory wells drilled noted any water.

2. The exploratory wells drilled were relatively shallow being approximately 300 feet deep, terminating a few hundred feet above the closest spring, 31-1.
3. The exploratory wells would have been sealed and abandoned to the requirements of the regulatory agency and therefore would be sealed.
4. According to Doug Thorton, the deep well(s) drilled have reported static water levels approximately 1,000 feet below the elevation of the springs. This being the case the wells penetrate aquifer zones different than the springs which all discharge from interfaces with confining bedrock.

SUMMARY

Based on my field investigation I find no potential hydrologic connection(s) between the U.S. Oil Sands project and any of the springs investigated on June 9, 2015 as documented within this memorandum.